



## ***FAULT FINDING***

### **COMPLAINT**

Engine will not start  
Engine misfires/will not idle correctly  
Engine lacks power  
Excessive exhaust smoke  
Oil pressure warning light stays on  
Abnormal noise from engine top end

# Fuel system - Troubleshooting

## COMPLAINT - Engine will not start

POSSIBLE CAUSE	POSSIBLE FAULT	ACTION	TESTS
Starter motor	Does not turn engine	See appropriate <b>Electrical Fault Finding Manual</b> .	
Fuel	No fuel in tank	Check/replenish fuel tank.	
Glow plugs	Inoperative	Check glow plugs and circuit.	Tests 2, 3 4
Fuel injection	Inoperative or defective	See <b>ENGINE MANAGEMENT - Fuel</b> .	
Mechanical	Lack of compression	Check compression.	Test 1

## COMPLAINT - Engine misfires/will not idle correctly

POSSIBLE CAUSE	POSSIBLE FAULT	ACTION	TESTS
Fuel injection	Intermittent on one or more cylinders	See <b>ENGINE MANAGEMENT - Fuel</b> .	
Mechanical	Lack of compression	Check compression.	Test 1

# Fuel system - Troubleshooting



## COMPLAINT - Engine lacks power

▲ **Note:** Ensure brakes are not binding

POSSIBLE CAUSE	POSSIBLE FAULT	ACTION	TESTS
Throttle cable	Too slack	Adjust cable.	Test 1
Fuel injection	Defective	See <b>ENGINE MANAGEMENT - Fuel.</b>	
Mechanical	Lack of compression	Check compression.	
Turbocharger (if fitted)	Faulty wastegate operation	Repair, renew as necessary.	
	Damaged or blocked boost sensing pipe	Repair, clear, pipe.	

## COMPLAINT - Excessive exhaust smoke

POSSIBLE CAUSE	POSSIBLE FAULT	ACTION	TESTS
Air cleaner	Blocked Symptom: Black smoke	Renew air cleaner element.	Test 1
Mechanical	Lack of compression	Check compression.	
Fuel injection	Defective	See <b>ENGINE MANAGEMENT - Fuel.</b>	

# Fuel system - Troubleshooting

## COMPLAINT - Oil pressure warning light stays on

POSSIBLE CAUSE	POSSIBLE FAULT	ACTION	TESTS
Low oil level	Failure to carry out daily check and top - up	Top - up and carry out recommended daily check/top - up.	
	Oil leak	Trace leak, repair as necessary.	
Wiring	Short circuit	Disconnect lead from oil pressure switch. Switch on ignition. If oil warning light remains on there is a short circuit.	
Oil pressure switch	Switch faulty	Fit and connect new switch. Run engine. If light goes out leave new switch on position.	
Oil filter	Blocked	Renew filter.	
Oil pressure relief valve	Dirty or defective	Clean or renew valve.	
Oil strainer	Blocked	Clean strainer.	
Oil pump	Worn	Examine, renew if defective.	
Big - end, main or camshaft bearings	Excessive clearance	Examine, renew if necessary.	



## COMPLAINT – Abnormal noise from engine top end

POSSIBLE CAUSE	POSSIBLE FAULT	ACTION	TESTS
Tappets noisy	Adjustment too slack	Adjust correctly.	Test 1
	Oil feed to valve gear restricted	Clear restriction.	
Tapping or rattling from top end	Sticking valve(s)	Check compression.	
	Loose valve guide(s)	Dismantle, check and repair as necessary.	

# Fuel system - Troubleshooting

## Test 1 Compression

**▲ Note:** This test can only be carried out with the battery in good condition.

1. Start engine (if possible), run it until it reaches normal running temperature, stop engine.
2. Disconnect lead from shut-off solenoid on injection pump.
3. Remove glow plugs.

## Test 2 Glow plug in glow plug tester (Tester DX900 illustrated)

1. Connect red lead to battery positive terminal and black lead to negative terminal.
2. Fit glow plug into tester and retain with spring loaded bar. Connect yellow lead to threaded portion of glow plug.
3. Press test button and note ammeter reading. Keep button depressed and glow plug tip should start to glow after 5 seconds.

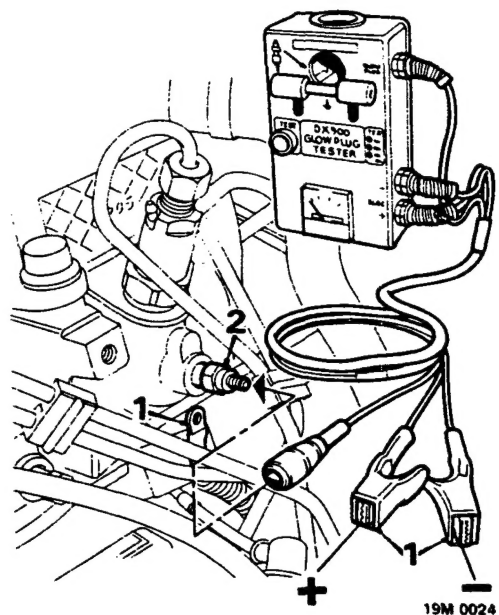
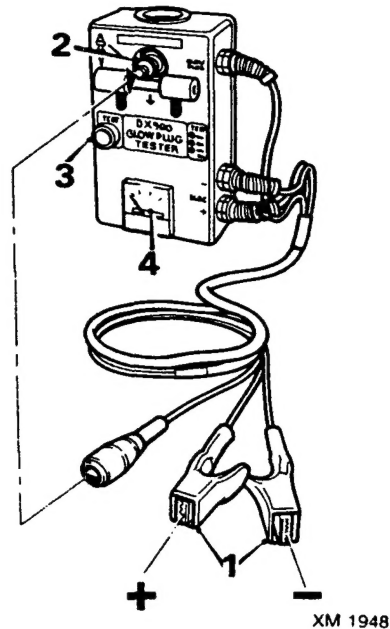
**▲ CAUTION:** The glow plug tip must glow first. If it fails to do so replace glow plug.

4. Ammeter reading should show initial current draw of 25 amps, which should fall to 12 amps after 20 seconds.

## Test 3 Glow plug in engine

1. Switch off master switch and disconnect electrical leads from glow plug (s) to be tested. Connect red lead of glow plug tester to battery positive terminal and black lead of tester to negative terminal.
2. Connect yellow lead of tester to threaded portion of glow plug. Press test button and note ammeter reading. Keep button depressed and note time taken for ammeter reading to stabilise. Compare results with figures given in Test 2.

4. Fit adaptor of a diesel compression tester into No. 1 glow plug position. Connect compression tester.
5. Operate starter motor until gauge reaches its highest reading, record reading and remove adaptor.
6. Repeat operations 4 and 5 for remaining cylinders and compare readings. All reading should be within 10% of each other and should all be above  $25 \pm 5$  bar,  $370 \pm 75$  lbf/in<sup>2</sup>.

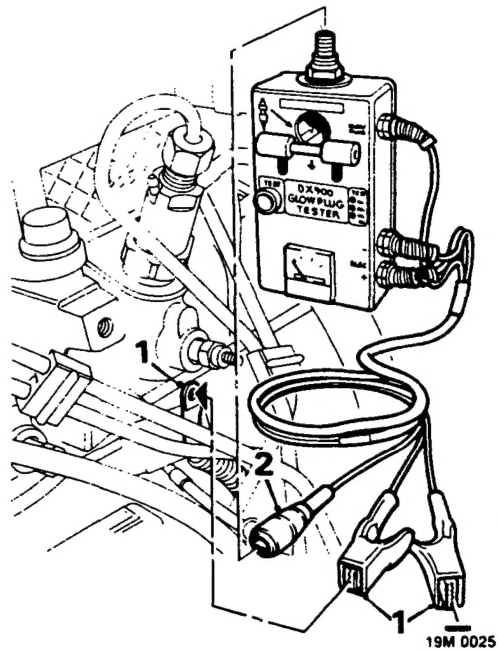




## Test 4

### Relay and timer circuit

1. Switch off master switch and disconnect supply lead from glow plugs. Connect read lead of glow plug tester to supply lead and connect black lead of tester to battery negative terminal.
2. Connect yellow lead of tester to a spare glow plug fitted in top of tester. Press and hold test button while switching on master switch and note ammeter reading. The reading should start to fall towards stabilised figure and drop to zero as timer breaks circuit.



# Fuel system - Troubleshooting

## ***FAULT FINDING***

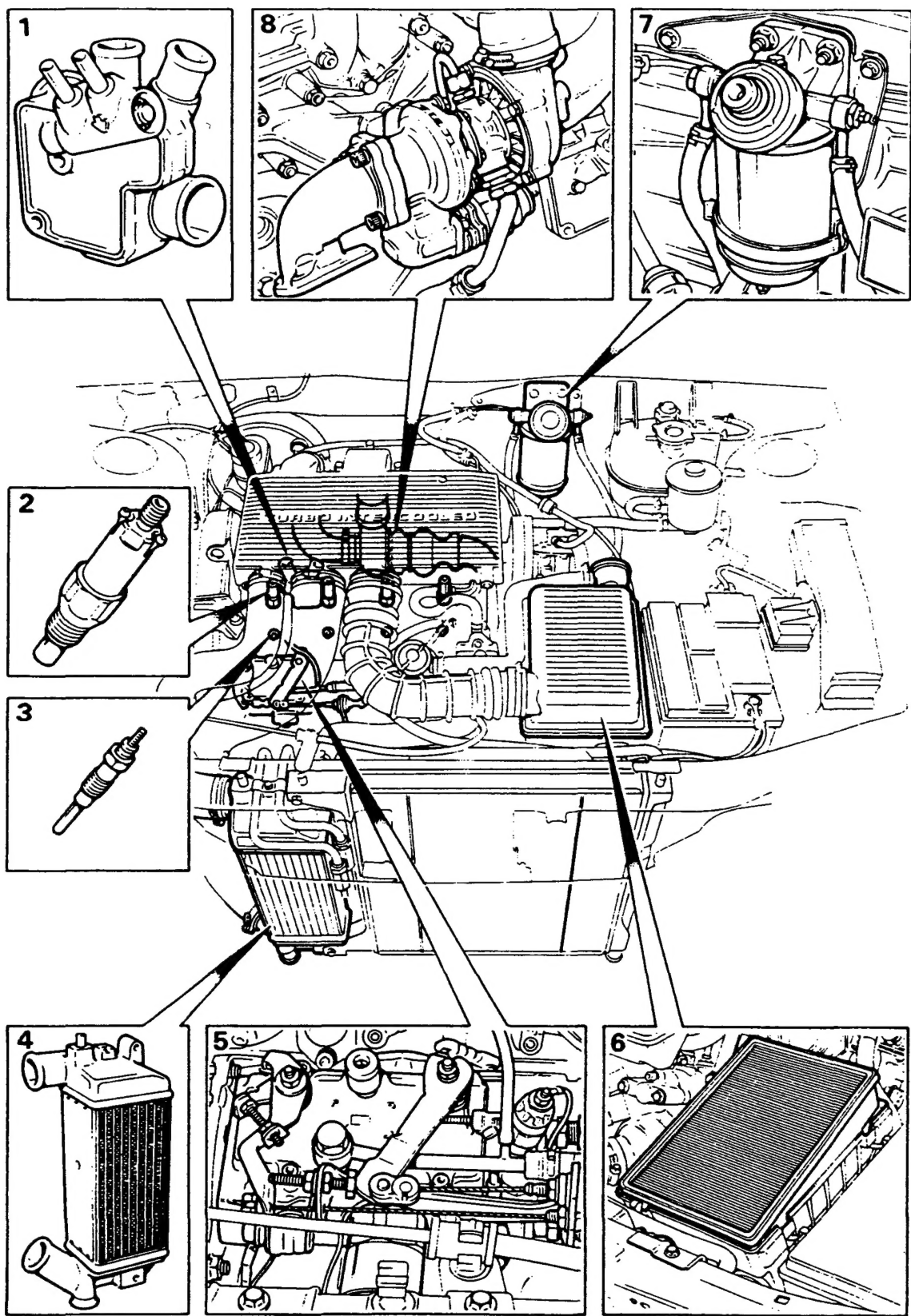
### **COMPLAINT**

Engine will not start  
Engine misfires/will not idle correctly  
Engine lacks power  
Excessive exhaust smoke

### **COMPONENT LOCATION**

- |  |                        |
|--|------------------------|
| 1. Fuel heater                             | 5. Fuel injection pump |
| 2. Fuel injector                           | 6. Air cleaner         |
| 3. Glow plug                               | 7. Fuel filter         |
| 4. Intercooler (turbo charged engine only) | 8. Turbocharger        |





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# Fuel system - Troubleshooting

## COMPLAINT - Engine will not start

POSSIBLE CAUSE	POSSIBLE FAULT	ACTION	TESTS
Stop/start solenoid	Remaining in stop position	See appropriate <b>Electrical Fault Finding Manual</b> .	
Air	In fuel system	Bleed fuel system.	
Fuel filter	Blocked	Clean filter, renew element.	
Fuel injector(s)	Defective	Check performance.	Test 1
Injection pump	Incorrectly timed	Check, correct timing.	
	Worn, defective	Check pump performance, repair, renew as necessary.	

## COMPLAINT - Engine misfires/will not idle correctly

POSSIBLE CAUSE	POSSIBLE FAULT	ACTION	TESTS
Air	In fuel system	Bleed fuel system.	
Air cleaner	Blocked	Renew air cleaner element.	
Fuel filter	Dirty	Clean filter, renew element.	
Fuel injector(s)	Defective	Check performance.	Test 1
Injection pump	Idling stop out of adjustment	Adjust idling stop.	
	Incorrectly timed	Check, correct timing.	
	Worn, defective	Check pump performance, repair, renew as necessary.	



## COMPLAINT - Engine lacks power

POSSIBLE CAUSE	POSSIBLE FAULT	ACTION	TESTS
Air	In fuel system	Bleed fuel system.	Test 1
Fuel filter	Dirty	Clean filter, renew element.	
Fuel injector(s)	Defective	Check performance.	
Injection pump	Incorrectly timed	Check, correct timing.	
	Worn, defective	Check pump performance, repair/renew as necessary.	

## COMPLAINT - Excessive exhaust smoke

POSSIBLE CAUSE	POSSIBLE FAULT	ACTION	TESTS
Fuel injectors	Defective	Check performance.	Test 1
Injection pump	Incorrectly timed	Check, correct timing	
	Defective	Check pump performance, repair/renew as necessary.	

# Fuel system - Troubleshooting

## Test 1

### Injectors

(Injector tester DX710 illustrated)

**▲ Note:** To identify faulty injector, run engine at idle speed. Slacken and tighten in turn each injector high pressure union. No change in engine speed while a particular union is loose, indicates that injector not performing correctly.

1. Engine stopped, remove suspect injector from engine and connect to tester.
2. Checking injector opening pressure:  
Rotate tester handle and note pressure at which injector operates, it should be:  
Normally aspirated engine =  $125 \pm 5$  bar.  
Turbocharger engine =  $130 \pm 5$  bar.
3. Checking spray pattern:  
Rotate tester handle fast enough to operate injector 4 or 5 times per second. Spray pattern should be finely atomised, uniform in shape, and should not contain splits or solid fuel. A slight centre core is permissible.
4. Checking for dribble:  
Wipe injector nozzle dry. Slowly rotate tester handle to create a pressure 10 bar below injector opening pressure. Hold pressure for 10 seconds, check nozzle. It should be dry.
5. If injector fails to meet any requirement in 2, 3 or 4, renew injector.

